

SEVERE LOCAL STORMS—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Greensboro, N. C., 15 miles southeast.	14	5:20 a. m.	100	0		Tornado.	On 1 farm 3 tobacco barns were destroyed, 1 full of tobacco for curing. Storm moved north-northeastward; path 2 miles long.
Rutland, Ill.	14				\$2,200	Hail.	Crop loss, \$2,000; property damage, \$200.
Manchester, Iowa, and vicinity.	14					Electrical.	Barn struck by lightning. A threshing crew had taken refuge in the building and 13 men and 17 horses were stunned by the bolt, but without serious injury. 2 houses struck by lightning with considerable damages.
Drysville and Lattnerville, Iowa, and vicinities.	14-15	P. m.		1	8,500	Rain and flood.	Several hundred acres of farmland and 3 city blocks flooded; about 40 homes affected. Highways covered with water and several hundred feet of railroad track washed out. Loss to crops, \$3,500; property damage, \$5,000.
Virginia.	14-18				1,430,500	Floods.	Floods of the James, Meherrin, Roanoke, and Blackwater Rivers caused \$860,000 damage to highways and bridges, about \$565,000 to crops and material which was not movable, and around \$5,500 to livestock.
Raymond, S. Dak., vicinity of.	15	4-6 p. m.	'1		10,000	High wind.	10 farm buildings and garage wrecked; other buildings damaged; minor crop loss; path 8½ miles long.
Traverse County, Minn.	15	P. m.			10,000	Thundersqualls and hail.	Several silos and small buildings wrecked. Loss to growing crops, \$9,000; property damage, \$1,000.
Seneca to Thedford, Nebr.	16	1:30-3:30 p. m.	'1-2		3,000	Hail and excessive rain.	Hail severe, but over grassland; principal damage by flooding.
Chouteau, Mont.	16	4 p. m.			600	Wind.	Damage to shocked grain; granary and fence destroyed.
St. Vrain, N. Mex., vicinity of.	16	9 p. m.	'1		7,000	Heavy hail.	Loss to crops.
Vanderburg County, Ind.	16				3,200	Wind.	Several greenhouses and garage damaged.
Hill City, Kans., south of.	23	7:30 p. m.	'3		2,000	Wind and hail.	Property damaged; path 10 miles long.
Chamberlain, S. Dak., and vicinity.	23	7:30-8:30 p. m.			13,000	High wind and heavy rain.	Electric lines, 3,000 feet of railroad trackage, and highway a mile east of Chamberlain damaged. Basements flooded. Property damage, \$10,000; crop loss, \$3,000.
Andover, S. Dak., 7½ miles north.	23	9:50 p. m.		0	53,000	Tornado.	Path narrow and from northwest to southeast with buildings scattered to northwest to southeast of path. About 50 small buildings damaged; some livestock and poultry killed. Property damage, \$50,000; crop loss, \$3,000.
Hill City, Kans., 8 miles northeast.	23	P. m.		0	4,500	do.	Damage to buildings on 1 farm where large barn was completely destroyed; small buildings damaged.
Verdel, Nebr., 4 miles northwest.	23	do.	'3		3,000	Hail and heavy rain.	Hail damage, \$1,000; flood damage to bridges and fields about \$2,000.
Mitchell, S. Dak., and vicinity.	24	8 p. m.	100		5,000	Wind, rain, and hail.	Brick farm building wrecked, others damaged. Telephone poles down; trees stripped of foliage; 1 person slightly injured. Property damage, \$3,000; crop loss, \$2,000.
Mesa, Colo., and vicinity.	25	7:30 p. m.			800	Heavy hail.	Storm severe on 4 ranches; loss to fruit and truck.
Kiowa, Colo.	25	P. m.	'1-2		4,000		Large hailstones; property damaged.
Cumberland, Md.	25				8,000	Heavy rain.	Property damaged.
Geneseo, Kans., 3 miles south.	26	9:40 a. m.	'1		3,000	Tornadic wind.	Damage to farm property; path 3 miles long.
Scott City, Kans., north of.	26	5-5:30 p. m.	'1		8,000	Heavy hail.	Hailstones accumulated 6 to 7 inches deep on the level. Property damage; loss to crops; path 3 miles long.
Anthony, Kans., vicinity of.	26	8 p. m.	33	0	3,000	Small tornado.	Tornado occurred in connection with general thunderstorm conditions and struck barn and outbuildings of a farm 8 miles west and 1 mile north of Anthony.
Blackstone, Ill.	26				6,000	Wind.	Property damage, \$3,500; crop loss, \$2,500.
Bradford, Ill.	26				2,300	do.	Crop loss, \$1,500; property damage, \$800.
Carlinville, Ill.	27				1,500	Electrical.	Barn burned.
Decatur, Ill.	27				2,500	Wind.	Property damaged.
Ogallala, Nebr.	28	6 p. m.	'2		1,000	Wind and hail.	Property damaged; loss in livestock.
Tulsa, Okla.	28	1:15-1:27 p. m.	'1		10,000	Hail.	Property damaged; path 2 miles long.
Kent County, Del.	31	P. m.		1	50,000	Heavy thunderstorm and flood.	Lake Como overflowed, washing out 2 bridges on the Du Pont Highway and parts of the Pennsylvania Railroad roadbed. A telephone lineman drowned.
Frederick County, Md.	31				75,000-100,000	Heavy thunderstorms.	Storm caused streams, already swollen from daily rains for a week to overflow their banks. Carroll Creek which flows southward through Frederick, reached an unprecedented crest and overflowed its banks and retaining walls for the first time in history. Merchandise in warehouses and stores damaged. Water reached to the tops of automobiles on municipal parking lot and entered many cellars. A concrete bridge and a trestle washed out.

SOLAR RADIATION AND SUNSPOT DATA FOR AUGUST 1940

SOLAR RADIATION OBSERVATIONS

By HELEN CULLINANE

Measurements of solar radiant energy received at the surface of the earth are made at nine stations maintained by the Weather Bureau, and at 10 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface

is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln the observations are made with the Marvin pyrheliometer; at Washington, Madison, and Blue Hill they are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Washington and Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct solar radiant energy averaged below normal at Washington, and above normal at Lincoln and Madison. There were comparatively few measurements during August, because of the large number of cloudy days.

The total solar and sky radiation was practically normal at all stations, except at Fairbanks, where there was an excess.

Polarization measurements made at Madison on 4 days give a mean of 55.8, compared with a normal for August of 58 percent, while the maximum was 65.1 on the 20th.

TABLE 1.—*Solar radiation intensities during August 1940*
[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.												
Date	Sun's zenith distance										Local mean solar time	
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		1:30 p. m.
	75th mer. time	Air mass										
		A. M.					P. M.					
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e	
	<i>Mm.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Cal.</i>	<i>Mm.</i>	
August 2.....	11.81	-----	0.42	0.61	0.84	-----	-----	-----	-----	-----	11.81	
August 9.....	14.97	0.23	.35	.45	.67	-----	-----	-----	-----	-----	12.24	
August 10.....	15.11	.25	.42	.53	.72	-----	-----	-----	-----	-----	12.68	
August 20.....	13.61	.42	.53	.65	.81	1.04	-----	-----	-----	-----	15.65	
August 25.....	18.59	-----	.53	.63	.71	-----	-----	-----	-----	-----	8.48	
Means.....	-----	.30	.45	.57	.75	(1.04)	-----	-----	-----	-----	-----	
Departures.....	-----	-.31	-.22	-.18	-.18	-.20	-----	-----	-----	-----	-----	

MADISON, WIS.												
August 7.....	9.83	0.65	0.74	0.81	1.02	1.44	-----	-----	-----	-----	-----	9.14
August 20.....	7.87	-----	1.03	1.11	1.31	1.51	-----	-----	-----	-----	-----	6.76
August 21.....	9.47	-----	.79	.95	1.16	1.30	-----	-----	-----	-----	-----	14.60
August 23.....	7.29	-----	.95	1.03	1.13	-----	-----	-----	-----	-----	-----	6.76
August 30.....	10.59	-----	-----	-----	.96	1.34	-----	-----	-----	-----	-----	12.24
Means.....	-----	(.65)	.88	.98	1.12	1.40	-----	-----	-----	-----	-----	-----
Departures.....	-----	-.07	+.07	+.04	+.02	+.07	-----	-----	-----	-----	-----	-----

LINCOLN, NEBR.												
August 6.....	10.59	-----	0.88	1.02	1.20	1.44	1.18	1.06	0.94	-----	-----	10.59
August 15.....	16.20	-----	.87	1.01	1.11	1.31	-----	-----	-----	-----	-----	17.96
August 19.....	7.87	-----	-----	.89	1.14	1.44	-----	-----	-----	-----	-----	9.14
August 30.....	9.83	-----	-----	-----	-----	1.26	.99	.79	.63	-----	-----	8.48
August 31.....	8.18	-----	-----	-----	1.21	1.48	-----	-----	-----	-----	-----	8.48
Means.....	-----	-----	(.88)	.97	1.18	1.40	(1.08)	(.98)	(.78)	-----	-----	-----
Departures.....	-----	-----	+.10	+.06	+.09	+.08	+.01	+.10	+.03	-----	-----	-----

* Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct + diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Albuquerque	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	Newport	Friday Harbor	Ithaca	Cambridge
July 30.....	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Aug. 6.....	644	512	549	471	583	697	670	408	---	588	443	360	621	633	596	---	---	592
Aug. 13.....	520	492	445	452	474	656	542	354	---	510	483	392	576	503	492	---	---	553
Aug. 20.....	306	371	507	313	328	653	621	407	---	497	458	511	564	473	477	---	---	515
Aug. 27.....	452	400	462	361	367	618	608	375	---	510	391	468	537	499	508	---	---	493
Aug. 27.....	318	345	417	343	177	536	618	255	---	404	416	520	---	360	354	---	---	380

DEPARTURES FROM WEEKLY NORMALS

July 30.....	+157	+35	+23	+57	+143	+27	---	+57	---	+37	-32	-32	+53	+2	+54	---	---	---
Aug. 6.....	+71	+32	-55	+46	+93	+11	---	+35	---	-5	-3	-2	+38	-4	-22	---	---	---
Aug. 13.....	-133	-73	+14	-89	-45	+22	---	+101	---	+22	-7	+136	+31	-32	-11	---	---	---
Aug. 20.....	+32	-43	-29	-53	+29	+20	---	+87	---	-2	-69	+80	+23	+30	+46	---	---	---
Aug. 27.....	-100	-63	-27	+2	-169	-41	---	+12	---	-62	-41	+109	---	-44	-71	---	---	---

ACCUMULATED DEPARTURES ON SEPT. 3, 1940

	+4,046	+3,178	-1,449	+3,528	+6,321	-616	---	+4,693	---	-4,641	+588	+7,611	---	-4,473	-2,447	---	---	---
--	--------	--------	--------	--------	--------	------	-----	--------	-----	--------	------	--------	-----	--------	--------	-----	-----	-----